

Evolving Socio-Spatial Dynamics in Traditional Chinese Village Dwellings

A typological analysis of Xiwu Village

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Abstract

Traditional Chinese villages embody rich built heritage and social memory but face crises of spatial degradation and memory loss due to rapid urbanization. Dwelling, as the main element of traditional villages, reflect social structure most directly. This study uses Xiwu Village for case study to trace the evolution of dwelling layout patterns from the mid-17th to mid-20th century and investigate their correlation with changes of social structure. Employing typological and statistical analysis to floor plans of 40 traditional dwellings, along with genealogies, archives, historical satellite images, in-depth interviews and other materials, the study identifies a simplified trend of layout patterns, which reflects a shift in social structure from big lineage-based to small family-centered. The study proposes planning suggestions for heritage preservation in Xiwu based on socio-spatial analysis, highlighting the importance of integrated preservation of tangible built heritage and intangible social memory in traditional villages.

Keywords

Dwelling, Socio-spatial dynamic, Typology, Social memory, Layout pattern, Integrated preservation

1. Introduction

Traditional Chinese villages encompass rich built heritage and social memory, holding significant historical, cultural, and social value. However, with the rapid development of urbanization, both tangible and intangible cultural heritage of traditional villages face the risk of extinction. For tangible cultural heritage, top-down government-led renewal and bottom-up resident-initiated renewal have led to the demolition of a large number of built heritage. For intangible cultural heritage, population loss and aging have led to the demise of social memory. Therefore, it is urgent to understand the value of built heritage and social memory in traditional villages and to implement strategic preservation and utilization.

The preservation of traditional villages should focus not only on distinct public buildings like ancestral halls and temples but also on the traditional dwellings that form the backbone of villages and shape their overall character. As Rapoport stated in *House Form and Culture*, dwellings most clearly illustrate the connection between spatial form and life pattern (Rapoport, 1969). He emphasized that dwellings were not just physical structures but institutional formations organized by socio-cultural factors. Among the various elements of dwellings, he focused on the layout, orientation, and decoration of dwellings, which align with the spatial forms of everyday lives. For traditional Chinese villages, dwellings are a major component of the built heritage, closely related to various daily activities (Knapp, 1989). There are ceremonial ancestor

worship spaces and functional living spaces in these dwellings, which constitute the dwelling layout pattern and reflect the social structure at the time of construction by showing homeowners' intention in the designs. Therefore, preserving traditional dwellings can help preserve the built heritage and social memories of traditional villages at the same time.

Current research mainly explores the relationship between settlement space and social structure on two scales: settlement and architecture. Settlement scale focuses on the socio-spatial connections within a single settlement (Shen, 1992; Chen et al., 1999; He and Sun, 2017; Dai, 2020), interpreting its cultural connotations (Lin, 2022; Yang and Zhang, 2020), analyzing its historical evolution (Pan et al., 2015), or conducting comparative studies of different settlements (Pan and Shi, 2014; Wang, 2009). Architecture scale traces the cultural origins of architectural forms (Zhang, 2020), focusing on their cultural connotations (Cai, 2020), socio-spatial connections reflected in dwelling layout patterns (Bustard, 1999), and their spatiotemporal evolutionary characteristics (Ruggiero et al., 2019; Zanfi et al., 2020; Yin and Liu, 2023; Li et al., 2023). It is necessary to integrate these two scales to preserve settlement and architecture. However, current research either focuses on one aspect or discusses the two separately due to limited materials (Gu and Huang, 2017; Yang et al., 2021). Most studies rely on floor plans and photos, and a few utilizing historical documents such as genealogies. Little research uses archives or in-depth oral histories.

This study quantitatively analyzes the floor plans of 40 dwellings from various periods and forms within the same settlement, integrating genealogies, archives, and oral histories. By integrating the settlement scale and architecture scale, it explores the evolution of dwelling layout patterns in traditional villages and how this evolution aligns with the changes in social structure.

2. Study area and method

2.1. Case study area

Xiwu Village, located in Ningbo City in eastern China, has three key features (Figure 1). First, it has a long history and a large lineage organization. Lineage organization refers to a large group residing within the same area based on patrilineal kinship. For example, the Wu lineage, settled in Xiwu since the mid-14th century, has grown into a large village of 6,000 people. Second, Xiwu is located on a plain at the foot of the mountains and was historically a key port for land and water transportation. It links important regional nodes like Ninghai, Taizhou, Fenghua, and Ningbo. Consequently, it enjoyed prosperous trade and had a marketplace since the mid-18th century. Third, Xiwu is located in the Yangtze River Delta, a wealthy region in late imperial China and open to international trade since the 1840s. Many new foreign cultural norms spreaded to this area and significantly impacted its rural areas.

Due to these factors, villagers in Xiwu accumulated rich capitals to construct high-quality dwellings, many of which have been well-preserved. Additionally, influenced by the ports, dwelling designs had transitioned from traditional to modern styles. Therefore, Xiwu offers a valuable case for studying the evolution of socio-spatial dynamics of cultural heritage and guiding integrated preservation efforts (Figure 2).

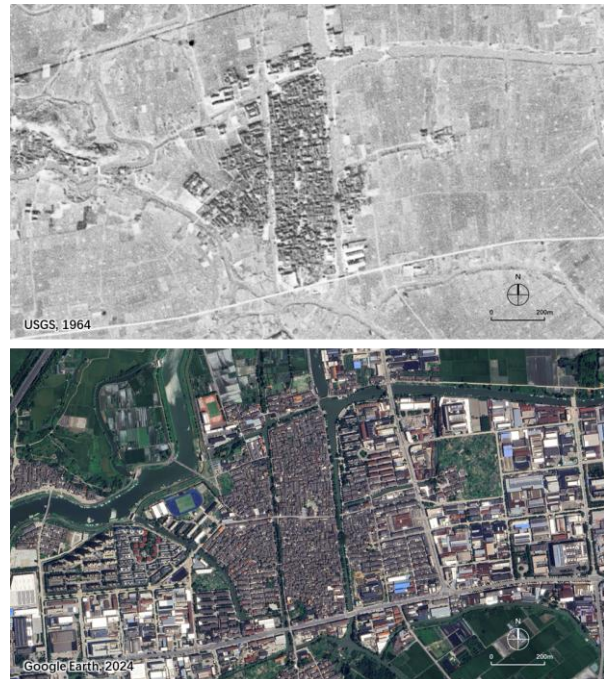
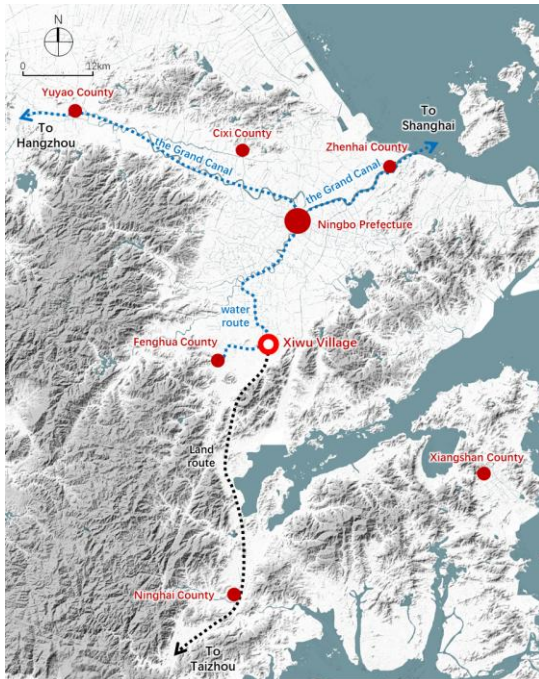


Figure 1. (left) Xiwu Village was an important port for water and land transportation. Source: Authors.

Figure 2. (right) Xiwu Village has preserved a large number of traditional dwellings. Source: USGS/Google Earth.

2.2. Study method

This study conducted several field surveys from 2019 to 2022. Research materials include in-depth interviews, historical documents, drone photography, detailed floor plans of 40 traditional dwellings from local museums, historical satellite images, and other materials such as village protection plan issued by government. We then utilized ArcGIS and AutoCAD to digitalize the dwelling layout patterns in Xiwu Village, which serves as our fundamental database for typological analysis. The study uses the first-floor plans of 40 dwellings in Xiwu as key materials, which are constructed from the mid-17th century to the mid-20th century.

Layout pattern reflects the relationship between the spatial configurations and how the owners use them. The typical dwelling layout pattern in the Eastern Zhejiang region, where Xiwu is located, follows an H-shape pattern (Cai and Dai, 2009; He and Sun, 2017) (L2). Based on this, an incremental pattern (L1) is formed by expanding horizontally or vertically, while a reduced pattern (L3) is formed by decreasing elements or changing the orientation (Figure 3). The dwelling layout is used for both lineage ritual and everyday lives. A dwelling typically contains one to two centralized lineage ritual spaces and a number of residential units. Different functions impose different requirements on space. For lineage rituals, ritual spaces should face south, with the residential units symmetrically arranged around them. For everyday lives, the size of the dwelling should align with the number of residents (Zhou, 2020). These factors shape the choice of dwelling layout.

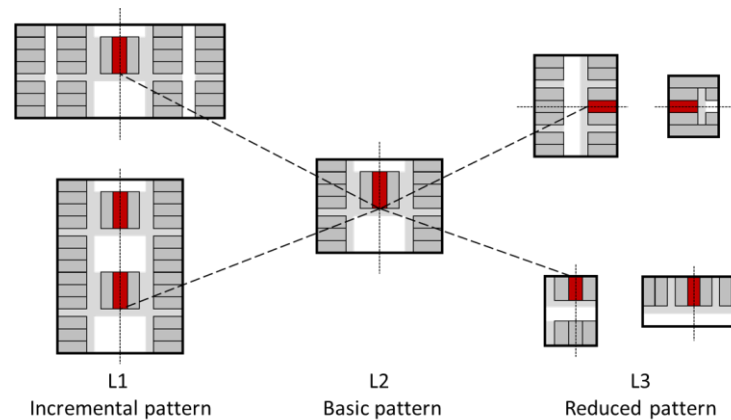


Figure 3. Three typical dwelling layout patterns in Xiwu Village. Source: Authors.

Therefore, the analysis of the dwelling layout pattern refers to several important indicators (Figure 4), including overall metrics such as historical period and layout pattern, as well as specific metrics based on dwelling layout like floor area, orientation, number of residential units, and number of stairs per household. Some of these indicators reflect underlying social structure through spatial forms. According to in-depth interviews with local villagers, lineage organization required that dwellings should strictly face south in ancient times. However, this requirement had become more flexible over time. Thus, changes in orientation can reflect the varying constraints of lineage organization on dwelling design. Additionally, the number of residential units reflects whether a dwelling is designed for extended families or individual households, showcasing changes in lifestyle. Moreover, the number of stairs per household partially reflects the comfort level of living in a dwelling. More stairs imply more shared facilities, leading to greater comfort for each family. All these indicators can reflect the rise and fall of the lineage organization in history.

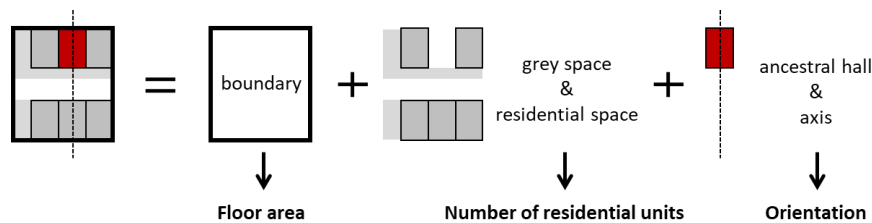


Figure 4. Decomposition of the basic elements of dwelling layout pattern and their spatial significance. Source: Authors.

Social structure refers to the composition of social members in a region who possess certain resources and opportunities, as well as the patterns of their relationships. In the southeastern region of the late imperial China, lineage organization is considered the most prominent form of social organization (Freedman, 1960). Lineage organization refers to a social group formed by families connected through patrilineal kinship, governed by patriarchal norms. It represents not only a biological relationship but also conscious organizational activities. As an organization based on patriarchal principles, lineage organization often pursues spatial order in settlements and architecture; the larger the lineage organization, the greater its influence on the spatial configuration of the settlement, which can lead to layouts that align more closely with ritual norms. Conversely, when the power of lineage organization is weaker, the authority over dwelling layout patterns shifts more to the homeowners.

This research analyzes the relationship between layout pattern and social structure. For layout pattern, it quantitatively analyzes the key indicators mentioned above to study the evolution of layout patterns across three periods. For social structure, it combines macro trends with micro evidence to analyze the rise and

fall of lineage organization. Based on this, the study explores the relationship and mechanisms, as well as practical strategies for value excavation and integrated preservation.

3. Result

3.1. Transformation of layout pattern

Based on significant historical events, the history of the 40 dwellings is divided into three periods (Figure 5): 1650s to 1850s (H1), 1850s to 1900s (H2), and 1900s to 1950s (H3). Dwellings are scattered throughout Xiwu. Those from the same period do not show clear clustering, indicating that the dwelling construction is a long, dynamic self-organizing process. The layout pattern mainly reflects the intentions of the owner.

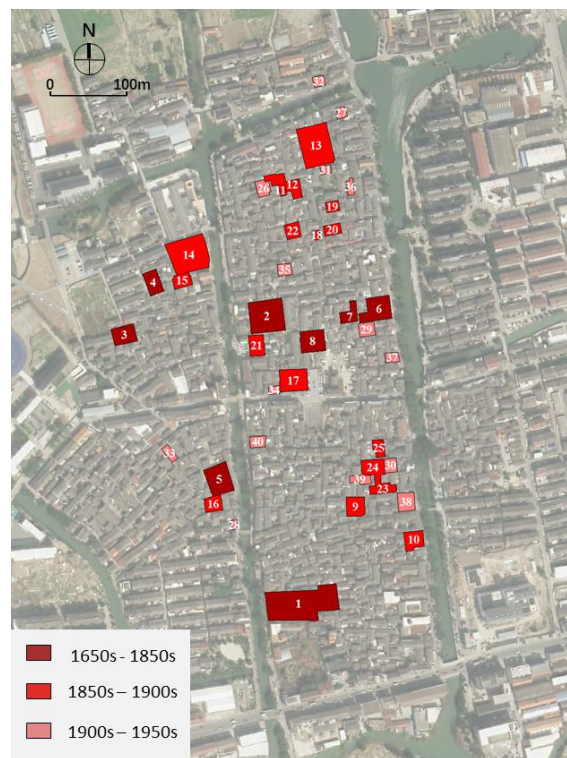


Figure 5. The temporal and spatial distribution of the 40 dwellings in Xiwu Village. Source: Authors.

Based on the three types of layout patterns and the three historical periods, the dwellings are classified (Figure 6). The study shows that incremental pattern mainly appeared in the early period, while the reduced pattern was more prevalent in the later period. In the early period, orientation of dwellings was predominantly north-south, whereas in the later period, orientation was more varied.

The evolution of dwelling layout patterns shows trends of miniaturization, simplification and a decrease in the number of residents. Overall, the dwelling layout patterns show a trend toward miniaturization and simplification. In terms of specific indicators, the decrease in floor area and number of units indicates a decrease in the number of nuclear families in each dwelling, reflecting the transition from large family to small one. At the same time, the gradual increase in the number of staircases per household reflects the improved life quality (Figure 7). These trend reflect several structural changes in society: first, the reduction of lineage restrictions on dwelling reflects the weakening of lineage power; second, the shift to smaller family units marks the transition from communal to individual living and people's pursuit of a higher quality of life.

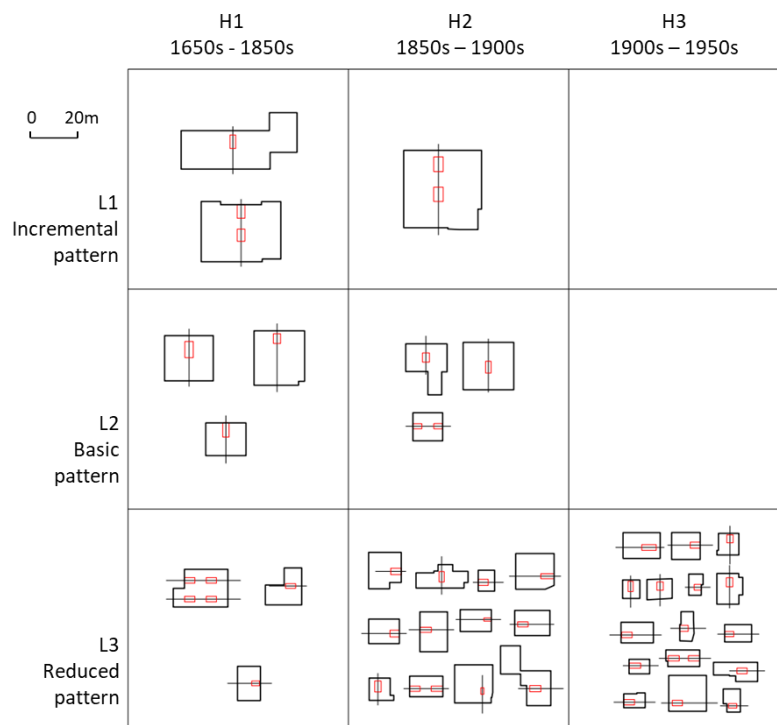


Figure 6. Classification of dwelling floor plans by construction year and layout pattern at the same scale.
Source: Authors.

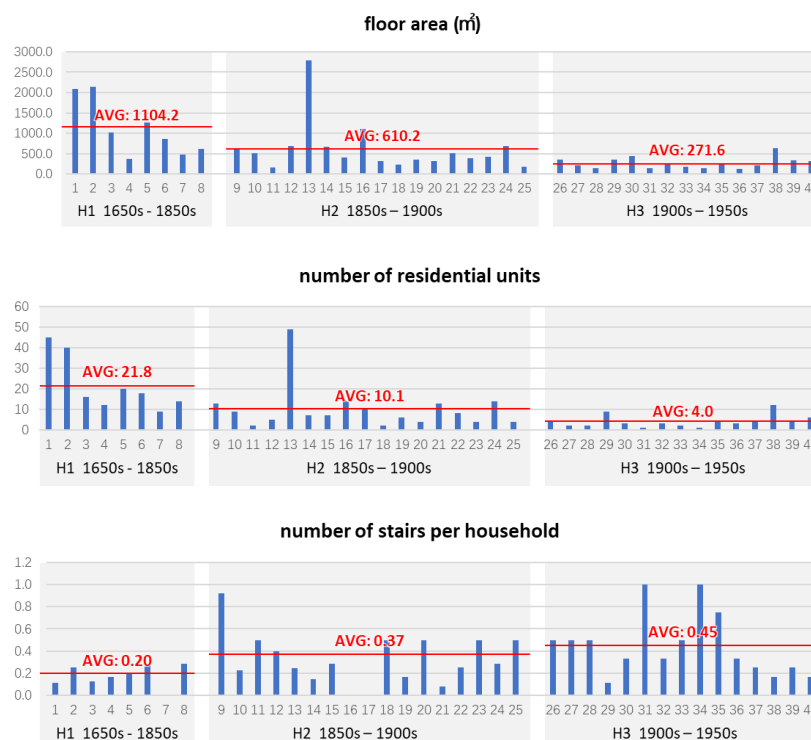


Figure 7. Trends of the average values of the three indicators over three history periods. Source: Authors.

3.2. Transformation of social structure

3.2.1. Decline of lineage organization

Since the Treaty of Nanking in 1842, Shanghai and Ningbo successively opened treaty ports and were the first five cities in China to engage in modern international trade. Consequently, international economic and cultural influence starts to manifest on China, slowly changing the socio-economic structure in the Qing dynasty. Although the major industry in regions around these trading ports was small-scale agriculture, an increasing number of people began to engage in commercial trade and physical labor at the ports. This led to a continuous flow of capitals and new perspectives and concepts back into rural areas, gradually shifting local social structure.

By the end of the 19th century, many villagers in Xiwu had already conducted business at the ports and were influenced by external thoughts. According to oral history, Wu Caiqin was baptized in 1868 at a church in Ningbo, which led to him being expelled from the lineage organization. His son, Wu Tingsheng, president of the Ningbo Shanghai Township Association, built the Zhenshen Tang (Jesus Church) in the center of Xiwu in 1923, which still stands today. Over more than fifty years, Xiwu shifted from rejecting to coexisting with Catholicism, reflecting a profound change in traditional lineage concepts, as evidenced by changes in dwelling layout patterns.

3.2.2. The change of occupation of dwelling owners in different periods

Representative dwellings with rich materials in three periods are selected to reveal the connection between changes in social structure and dwelling layout, focusing on homeowners.

In period 1 (1650s-1850s), the cases of Jiudai Changmen (1-H1-L1), Chengsan Changmen (6-H1-L3), and Houfan Changmen (13-H2-L1) are chosen. They have large and orderly layouts, which are representative of this period (Figure 8). According to genealogies and interviews, their owners were officials of the Qing Dynasty through the imperial examination system. Lineage played an important role in this process as these owners are usually supported by the lineage organization and expected to help the lineage organization when they succeeded. Therefore, lineage influences dwelling design, typically resulting in a similar layout: large, south-facing, and regular in form, accommodating extended families.

In period 2 (1850s-1900s), the cases of Tang Fang (14-H2-L3), Yu Fang (9-H2-L3), Shang Fang (23-H2-L3), and Zhou Fang (24-H2-L2) are selected. Compared to the previous period, they transitioned from orderly to more free layouts (Figures 9). According to genealogies, owners of these buildings were the sons of the same family (Figures 10). However, their dwellings exhibit entirely different forms, and there is a notable trend of donating to secure official positions. Donating to secure official positions refers to a practice where individuals could donate money or goods to the state to obtain noble titles or official positions. This trend reveals that the development of this lineage relied more on economic means rather than imperial examination. Consequently, the role of the lineage organization in supporting the examination diminished, which allows the four brothers to build their houses flexibly without being restricted by lineage rules.

In period 3 (1900s-1950s), the cases of Hongkuan Fang (12-H2-L3), Meichuan Fang (26-H3-L3), Wu Zhihai's Former Residence (33-H3-L3), and Chengbai Fang (36-H3-L3) are selected. They are characterized by smaller and more flexible layouts (Figure 11). According to in-depth interviews and history documents, the owners of these dwellings engaged in business or managed commercial activities in port cities like Ningbo and Shanghai, primarily residing there and occasionally returning home. Thus, the relationship between homeowners and the lineage organization weakened during this time, which further liberated dwelling layout.

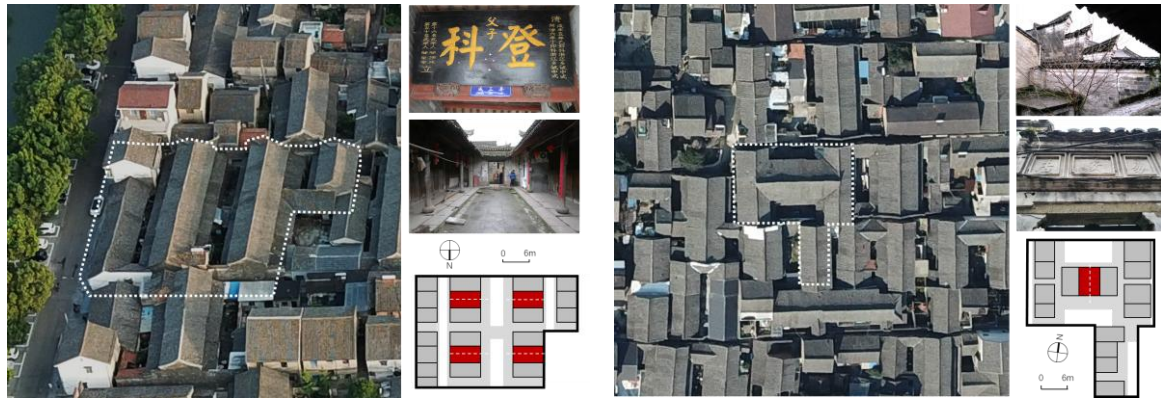


Figure 8. (left) In period 1, a typical case is Chengsan Changmen, where the homeowner succeeded in the imperial examination system. This is evidenced by the plaque in the upper right corner, which records that a father and son achieved the rank of Juren in 1855 and 1867, respectively. This reflects the imperial examination as the mainstream developmental path for individuals within the lineage organization at that time. Source: Authors.

Figure 9. (right) In period 2, a typical case is Zhou Fang, where the homeowner engaged in local business activities. Source: Authors.

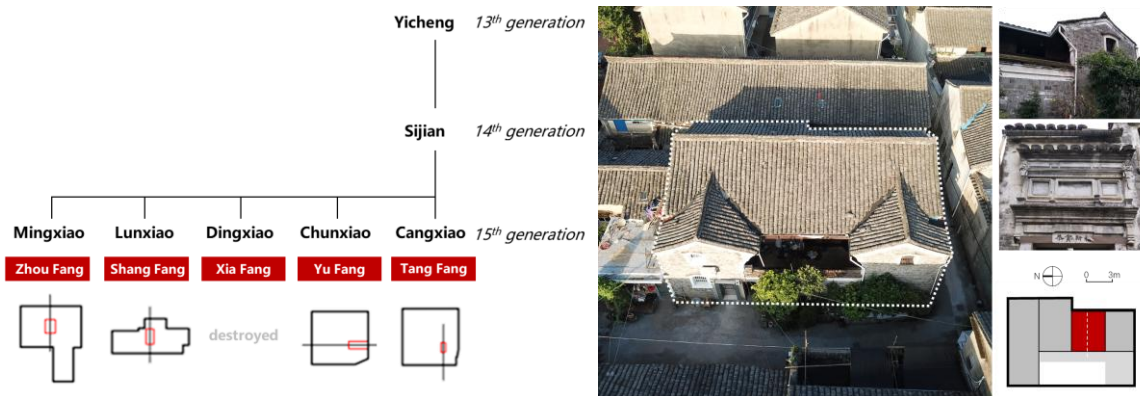


Figure 10. (left) Four typical cases from period 2, each displaying distinct forms. Source: Repainted from historical documents.

Figure 11. (right) In period 3, a typical case is Chengbai Fang, the homeowner conducted business in Shanghai. Source: Authors.

The comparison of representative dwellings from the three periods reveals a simplification of layout patterns over time. The identities of homeowners shifted from officials to local merchants and then to merchants in port cities. Homeowners increasingly embraced external cultural influences, prioritizing individual comfort over collective living. Their choices reflect broader social structural changes: with regional economic development and international cultural impacts, the traditional lineage society gradually transformed into a more atomized modern society. Correspondingly, dwelling layouts shifted from orderly to flexible, and from ritual constraints to comfort.

3.3. Interaction mechanism

The mechanism of social structure and dwelling layout pattern is summarized in Figure 12. In the case of Xiwu, the lineage organization is the original social structure, and lineage rituals impose strict regulations on building orientation and layout for homeowners. However, since the mid-19th century, many villagers engaged in business outside the village, weakening the relationship between the lineage and the villagers. This migration brought capitals and new cultural concepts from port cities, enabling villagers to break free

from lineage constraints and pursue individual comfort in housing design. This mechanism applies not only to Xiwu but also offers insights for the transformation of other traditional Chinese villages. Within this mechanism, social structure influences homeowners through economic and cultural factors, and the homeowners' values are reflected in the design of their dwelling layout. The former constitutes an important part of social memory, while the latter represents built heritage. Dwellings embody both invisible social memory and visible built heritage, making them crucial for the integrated preservation of intangible and tangible heritage in traditional village.

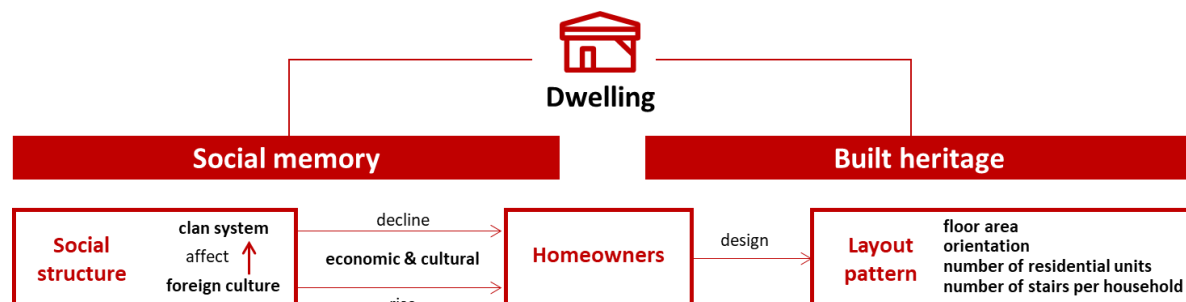


Figure 12. The socio-spatial mechanism in the modern transformation of traditional Chinese villages

3.4. Planning suggestions

In 2019, the "Protection Plan for the Historical and Cultural Village of Xiwu in Fenghua District, Ningbo City" was issued. This plan delineates zones for preservation, construction control, and environmental coordination based on village layout, cultural heritage sites, historical buildings, and environmental factors. It emphasizes the preservation of festive customs, traditional crafts, and historical narratives to address both tangible and intangible cultural heritage (Figure 13, left). However, the plan still has several shortcomings. For tangible heritages, only one historic bridge is designated as a cultural heritage site, while the majority of historical buildings, primarily traditional dwellings, lack targeted preservation methods, which leads to a loss of focus in preservation efforts. For intangible heritages, the approaches are shallow and cannot fully reveal the social structure dynamics that's worth preserving.

Findings of this paper provides insights into planning recommendations. The 40 historical buildings can be classified into three types. For each type, those with high-value should be prioritized for preservation, while others will undergo general preservation methods (Figure 13, right). This approach makes preservation practices more actionable by combining preservation priorities with diversity concerns. Furthermore, one representative dwelling from each type should be chosen for exhibitions, providing a spatial medium for the display of social memory and its transmission.

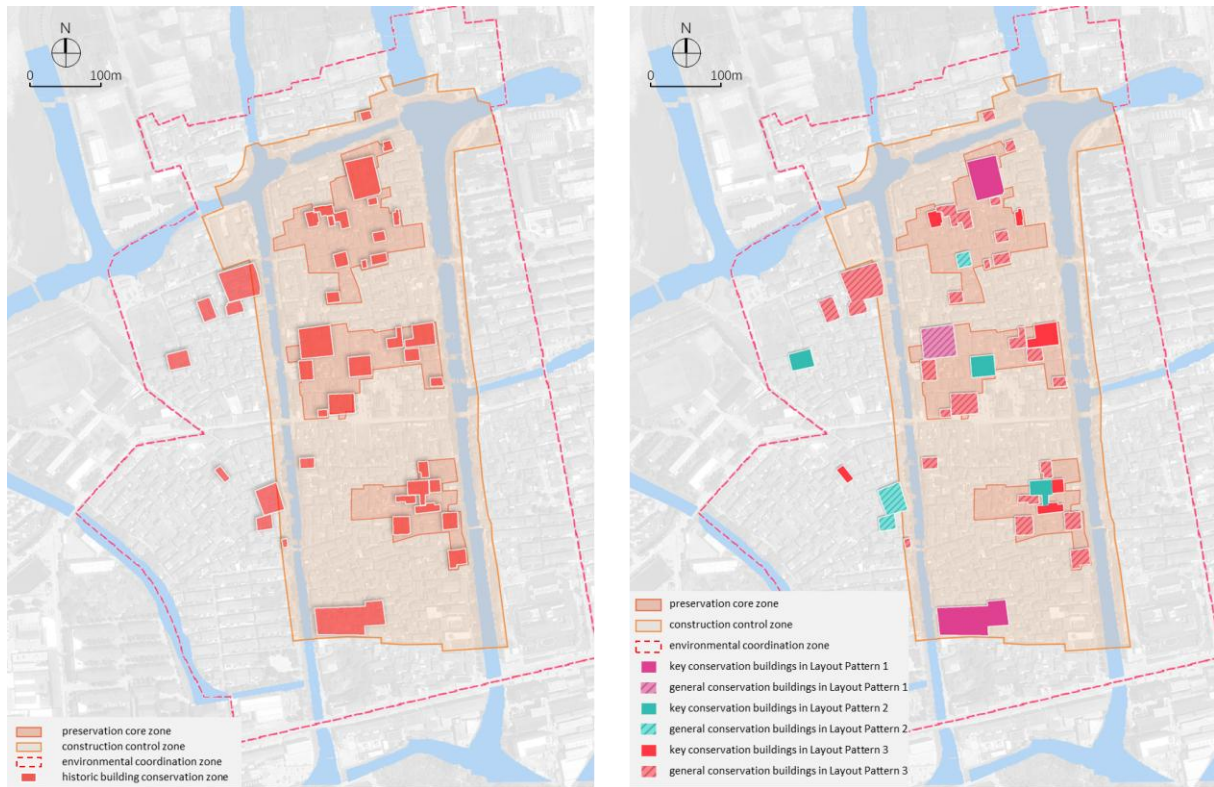


Figure 13. Adjusting the existing preservation strategies based on socio-spatial analysis by classifying historic buildings into different levels of preservation. Source: The left map is repainted from the preservation planning provided by the local government, the right map is redrawn by the authors on the basis of the left map.

4. Conclusion and discussion

This study focuses on the evolution of dwelling layout patterns in traditional Chinese villages and how it reflect changes in broader social structure. It selects 40 dwelling layouts from Xiwu Village as research subjects, and employs typological analysis and statistical methods to explore socio-spatial evolution.

This research identifies three distinct periods in the evolution of dwelling layout patterns: 1650s to 1850s, 1850s to 1900s, and 1900s to 1950s. A trend toward simplification is evident, characterized by decrease in floor area and residential units, increase in the average number of staircases per household, and shifts in architectural orientation. Regarding homeowners identities, there was a transition from officials to merchants, and from local towns to port cities. Overall, these changes reflect a weakening of constraints imposed by lineage organization and the rise of individual consciousness during the modernization process. Regional economic development and the influence of external culture were driving factors in this proces.

Since the mid-19th century, external cultural influences penetrating deeper inland through port cities, which influenced social structure across various regions and were manifested in settlement spaces. In southeastern China, exemplified by Xiwu, the power of lineage organization gradually diminished under the influence of external culture, leading to a shift from a big lineage-based social structure to small family-centered social structure. Dwelling layout patterns therefore evolved from large and formal to small and flexible. These phenomena and their underlying socio-spatial mechanisms have broad applicability in southeastern China and beyond.

In order to preserve and revitalize traditional villages, it is crucial to consider the relationship between dwelling layout patterns and social structure, and establish a socio-spatial framework to reveal the spatial carriers of social memory. For Xiwu, the broader social context, shifts in homeowner identities, and changes in lineage concepts represent valuable social memories, with dwelling layout patterns serving as spatial carriers. A more inclusive perspective should be adopted to revitalize traditional villages and excavate social memories, focusing not only on heritage classification but also on preserving dwellings from different periods and of different layout patterns. By doing so, we can ensure an integrated preservation of both tangible and intangible heritage.

There are a few limitations in the study. First, the relatively small sample size of early dwellings may affect the measurement of certain indicators. Future research should go beyond individual villages to include more case studies to further validate the generalizability of the findings. Second, in-depth interviews with case studies could also be conducted to analyze the specific mechanisms of socio-spatial interactions.

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Declaration of AI-assisted technologies in the writing process

During the writing process of this paper, the authors used AI-assisted technology (ChatGPT) to improve language because the mother language of the authors is not English. After using it, the authors reviewed and edited the paper carefully and take full responsibility for the content of the publication.

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